FLEXIBLE ELECTRONIC DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority from and the benefit of Korean Patent Application No. 10-2015-0133408, filed on Sep. 21, 2015, which is hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND

[0002] Field

[0003] Exemplary embodiments relate to a flexible electronic device. More particularly, exemplary embodiments relate to a flexible electronic device including a touch panel.

[0004] Discussion of the Background

[0005] Various display devices used for a multimedia device, such as a television set, a mobile phone, a tablet computer, a navigation system, a game unit, etc., have been developed. As an input device for display devices, a keyboard or a mouse is used. In addition, display devices may include a touch panel as an input device.

[0006] A display device may be formed to have various shapes, as compared to a flat panel display device. For instance, various flexible display devices, e.g., a curved display device, a bent display device, a foldable display device, a rollable display device, etc., have been developed.

[0007] The above information disclosed in this Background section is only for enhancement of understanding of the background of the inventive concept, and, therefore, it may contain information that does not form the prior art that is already known in this country to a person of ordinary skill in the art.

SUMMARY

[0008] Exemplary embodiments provide a flexible electronic device having improved reliability.

[0009] Additional aspects will be set forth in the detailed description which follows, and, in part, will be apparent from the disclosure, or may be learned by practice of the inventive concept.

[0010] According to an exemplary embodiment of the present invention, a flexible electronic device includes a base substrate and first and second lines disposed on the base substrate. The first and second lines extend in a first direction and are arranged in a second direction different from the first direction. Each of the first and second lines includes a first conductive layer including first portions and second portions alternately disposed with the first portions, and second conductive layers respectively overlapped with the first portions of the first conductive layer in a third direction substantially perpendicular to the first and second directions. The second conductive layer are not overlapped with the second portions of the first conductive layer in the third direction. The first and second conductive layers have a first modulus and a second modulus, respectively. A first width in the second direction of each of the first portions of the first conductive layer is smaller than a second width in the second direction of each of the second portions of the first conductive layer.

[0011] According to an exemplary embodiment of the present invention, a flexible electronic device includes a base substrate and a line disposed on the base substrate. The lines extends in a first direction and is curved with respect to a folding axis substantially parallel to a second direction different from the first direction. The line includes a first conductive layer having a first modulus and a second conductive layer having a second modulus different from the first modulus. The first conductive layer includes a first portion having a first width in the second direction and a second portion extending from the first portion in the first direction and having a second width less than the first width in the second direction. The second conductive layer is overlapped with the first portion of the first conductive layer in a third direction substantially perpendicular to the first and second directions and not overlapped with the second portion of the first conductive layer in the third direction.

[0012] According to exemplary embodiments of the present invention, a first modulus of a first conductive layer is less than a second modulus of a second conductive layer, such that a line including the first and second conductive layers may have improved flexibility and the resistance per the unit length, as the second conductive layer has a conductivity higher than that of the first conductive layer. The second conductive layer is disposed to correspond to a first portion of the first conductive layer, to prevent a crack occurring in the second conductive layer when the line is being curved, which may improve reliability and electrical characteristics of the line.

[0013] The foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The accompanying drawings, which are included to provide a further understanding of the inventive concept, and are incorporated in and constitute a part of this specification, illustrate exemplary embodiments of the inventive concept, and, together with the description, serve to explain principles of the inventive concept.

[0015] FIG. **1** is a perspective view showing a flexible display device according to an exemplary embodiment of the present invention.

[0016] FIG. **2**A is a perspective view showing a display device according to an exemplary embodiment of the present invention.

[0017] FIG. **2**B is a cross-sectional view showing a display device according to an exemplary embodiment of the present invention.

[0018] FIG. **3** is a cross-sectional view showing a touch panel according to an exemplary embodiment of the present invention.

[0019] FIG. **4** is a plan view showing a touch panel according to an exemplary embodiment of the present invention.

[0020] FIG. **5**A is an enlarged plan view of portion A of FIG. **4**.

[0021] FIG. **5**B is a cross-sectional view taken along line I-I' of FIG. **5**A.

[0022] FIG. **5**C is a cross-sectional view taken along line II-II' of FIG. **5**A.

[0023] FIG. **6** is a graph showing a probability of occurrence of open defects as a function of a width of line.

[0024] FIG. **7** is a plan view showing a touch panel according to an exemplary embodiment of the present invention.